AFOEHL REPORT 90-130EQ00077GEF

Stormwater Characterization and Lagoon Sediment Analysis Grand Forks AFB ND

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PAUL T. SCOTT, Capt, USAF

July 1990

Final Report

AF Occupational and Environmental Health Laboratory (AFSC)
Human Systems Division
Brooks Air Force Base, Texas 78235-5501

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13. ABSTRACT *(Maximum 200 words)*

At the request of the 842nd Strategic Hospital/SGPB, personnel of the AFOEHL Water Quality Function conducted sampling in the wastewater treatment lagoons and stormwater runoff at Grand Forks AFB. The base was concerned about whether the unlined lagoons were creating a potential groundwater contamination problem and whether their stormwater runoff met North Dakota state stream standards.

Lagoon sediment did not contain Extraction Procedure hazardous chemicals. Stormwater runoff exceeded state standards for boron, phosphates, and phenols and contained trace levels of methylene chloride. Characterization of lagoon influent showed it to be generally representative of domestic sewage, but also contained trace levels of boron, phenols, toluene, cyanide, chloroform, methylene chloride and ethyl benzene. Keywords: Waste water treatment, Storm water runoff, Air Force facilities, North Dakota. (MM)

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ACKNOWLEDGEMENTS

The author greatly appreciates the technical expertise and hard work provided by the other members of the survey team, TSgt Ty Parrish, Sgt Dwayne Casey, and Sgt Pete Davis.

We also acknowledge the excellent support by the entire Bioenvironmental Engineering Services office, but especially Lt Helen England, the instigator and host project officer for the survey.

Contents

ILLUSTRATIONS

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I. INTRODUCTION

The 842nd Strategic Hospital (SAC)/SGPB requested the AF Occupational and Environmental Health Laboratory assist in: (1) identifying hazardous chemicals in the lagoon wastewater treatment system, and (2) characterizing the base's stormwater discharge at the main gate outfall. Appendix A is a copy of the request letter.

Maj John G. Garland III, TSgt Tae I. Parrish, Sgt Harold D. Casey, and Sgt Robert P. Davis, conducted the survey from 29 August 1989 to 1 September 1989. Capt Burl Olson, Chief Bioenvironmental Engineering, and Lt Helen England, Base Bioenvironmental Engineer, were our primary points of contact.

The scope of the lagoon survey included characterizing the wastewater entering the lagoon, measuring the lagoon system's dissolved oxygen levels, and collecting sediment samples from 21 points in the 3-cell lagoon system.

The scope of the stormwater survey included characterizing the wet-well fed continuous stormwater discharge near the base's main gate.

A detailed draft field report was left with the base before the team's departure.

II. DISCUSSION

A. Introduction

Grand Forks AFB is located in Grand Forks County approximately 15 miles west of Grand Forks ND. The base working population is approximately 5,200 military and 600 civilians. Approximately 6,000 personnel live on base.

The region surrounding Grand Forks is great plains farmland and subject to highly variable temperatures, rainfall, and wind. During this survey the temperatures ranged from 51 to 73 degrees Fahrenheit. It rained 0.64 inches. August 1989 was the wettest month of the year with 3.2 inches of recorded rainfall. This included 1.24 inches of precipitation on 18 Aug 89, 0.22 inches on 21 Aug 89, 0.46 inches on 27 Aug 89, and 0.26 inches on 28 Aug 89.

The Grand Forks mission is to provide strategic offensive forces. Industrial operations stem from facility, vehicle, missile, B1, B52, and KC-135 aircraft maintenance.

B. Sewerage System

The base has separate sanitary and storm drainage systems. Workplace effluent is discharged into both systems depending on the nature of the waste.

The base's wastewater flows into a lagoon system (Figure 1) at approximately 0.8 mgd. The first cell (Cell 1) is a 67 acre primary lagoon. The base drains Cell 1 into one of two secondary lagoons as needed. The northeast secondary lagoon (Cell 2) is also 67 acres. The remaining secondary lagoon (Cell 3) is located between Cell 1 and Cell 2 and covers 35 acres.

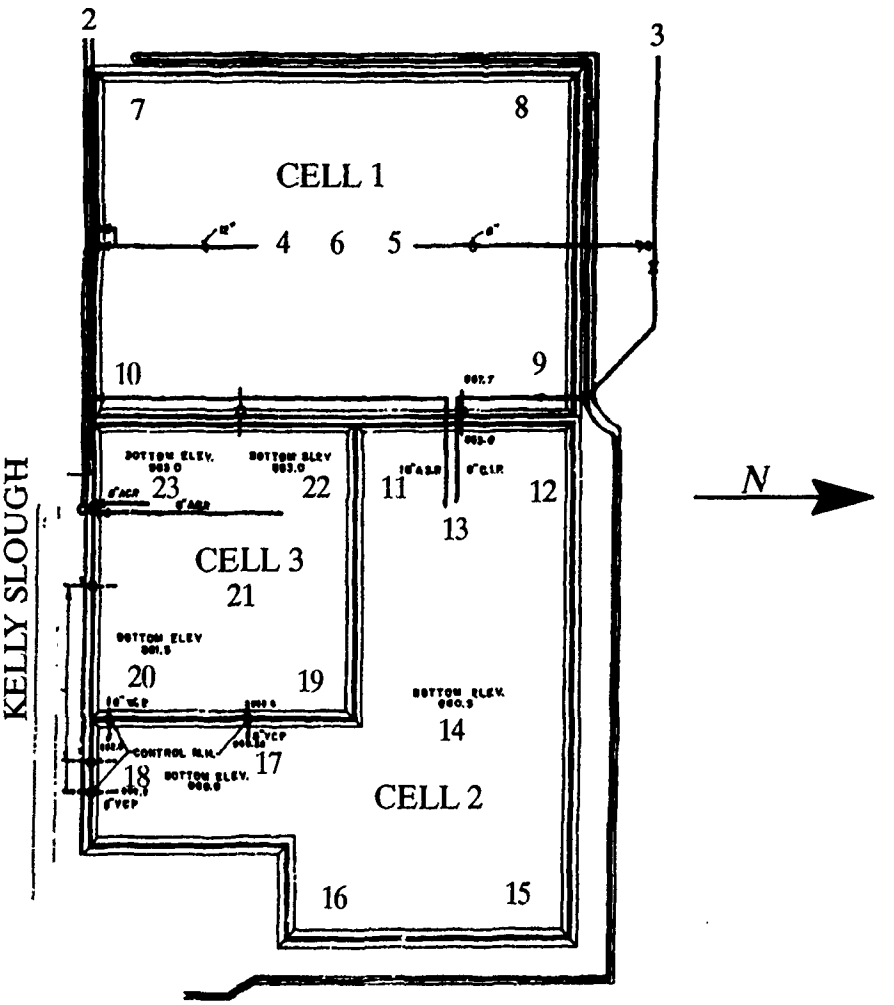


FIGURE 1. Lagoon Treatment System

Semiannually, the base drains Cells 2 and 3 into Kelly slough. The state regulates this discharge with National Pollutant Discharge Elimination System (NPDES) permit number ND-0020621. Appendix B contains the permit

information. The base has met NPDES standards in the past, including fecal coliform, pH, five day biochemical oxygen demand (BOD5), and suspended solids. The base had two principal concerns with respect to the treatment lagoon. The first concern was hazardous chemicals which had accumulated in the sediment of the lagoons and would pose a threat to groundwater or classify the lagoon sediment as hazardous waste. The second related concern was whether industrial workplaces on the base were disposing of hazardous chemicals into the sanitary system.

Stormwater exits the base at seven major outfalls. Most have intermittent flow. The outfall of major concern to the base was the one near the main gate. This outfall is fed by a missile silo wet-well and flows continuously. This outfall drains several maintenance areas, aircraft taxiway and parking areas, and the southern portion of the primary runway.

The main-gate stormwater outfall also drains into Kelly slough. North Dakota classifies Kelly slough as a Class II stream. Appendix C contains information on the state's Class II limitations.

C. Survey Procedures

1. Sampling

a. Sampling Site Numbers and Locations. Table 1 includes a list of locations and type of wastewater sampling. Figure 1 shows the approximate locations of the sanitary and lagoon sampling sites.

Table 1. Sampling Site Locations

Site	Location	Type
1	Main gate stormwater effluent	Storm
2	Sewage lift station, bldg 801	Sanitary
3	Sewage lift station, bldg 3136	Sanitary
4	Lagoon Cell 1, south central	Lagoon
5	Lagoon Cell 1, north central	Lagoon
6	Lagoon Cell 1, central	Lagoon
7	Lagoon Cell 1, southwest corner	Lagoon
8	Lagoon Cell 1, northwest corner	Lagoon
9	Lagoon Cell 1, northeast corner	Lagoon
10	Lagoon Cell 1, southeast corner	Lagoon
11	Lagoon Cell 2, southwest corner	Lagoon
12	Lagoon Cell 2, northwest corner	Lagoon
13	Lagoon Cell 2, influent area	Lagoon
14	Lagoon Cell 2, central area	Lagoon
15	Lagoon Cell 2, northeast corner	Lagoon
16	Lagoon Cell 2, southeast corner	Lagoon
17	Lagoon Cell 2, southcentral area	Lagoon
18	Lagoon Cell 2, effluent area	Lagoon
19	Lagoon Cell 3, northeast corner	Lagoon
20	Lagoon Cell 3, southeast corner	Lagoon
21	Lagoon Cell 3, central area	Lagoon
22	Lagoon Cell 3, north influent area	Lagoon
23	Lagoon Cell 3, southwest area	Lagoon

b. The survey team collected two days of 24-hour, equiproportional samples composited hourly at sample sites 1, 2, and 3 using Isco 2700 Automatic Wastewater Composite Samplers. Samples were collected in 3-gallon glass containers surrounded by ice. Each day the team collected the composite samples from the sample sites, siphoned, preserved, and shipped aliquots to AFOEHL for analysis.

c. The team collected a sediment sample at site 1 and at all lagoon sites for EP toxicity analysis. These were preserved on-site and shipped to an AFOEHL contract laboratory for analysis.

d. The team measured the lagoon dissolved oxygen (DO) at sites 6, 14, and 21 on 30 Aug 1989 using a direct reading dissolved oxygen probe. Technicians measured DO at two levels, approximately six inches from the surface and approximately six inches from the bottom at each site at approximately 0600, 0800, 1000, 1400, 1600, and 2100.

2. Sampling Analyses. Table 2 lists the method of analysis and sample preservation prescribed for each parameter. Appendix D shows which analyses were performed at each site.

Table 2. Analysis And Sample Preservation Methods

Parameter	Preservation	EPA Method	Where Analyzed	Who Analyzed
Total Alkalinity	H_2SO_4	310.2	Brooks AFB	AFOEHL
Boron	H_2SO_4	212.3	Brooks AFB	AFOEHL
Characteristic Hazardous Waste (EP Toxicity)	none	SW846	Beltsville MD	Biospherics
Chemical Oxygen Demand	H_2SO_4	410.4	Brooks AFB	AFOEHL
Cyanide (Total)	NaOH	335.2	Brooks AFB	AFOEHL
Dissolved Oxygen	none	360.1	On-site	AFOEHL
Dissolved Solids (Total)	H_2SO_4	160.1	Brooks AFB	AFOEHL
Kjeldahl Nitrogen	H_2SO_4	351.2	Brooks AFB	AFOEHL
Oils and Grease	H_2SO_4	413.1	Brooks AFB	AFOEHL
Pesticides	H_2SO_4	608 & 608.2	Brooks AFB	AFOEHL
pH	none	150.1	On-site	AFOEHL
Phenols	H_2SO_4	604	Brooks AFB	AFOEHL
Petroleum Hydrocarbons (Total)	H_2SO_4	418.1	Brooks AFB	AFOEHL
Phosphorus (Total)	H_2SO_4	365.3	Brooks AFB	AFOEHL
Residue (Total)	H_2SO_4	160.3	Brooks AFB	AFOEHL
Sulfate	none	375.2	Brooks AFB	AFOEHL
Surfactants - MBAS	none	425.1	Brooks AFB	AFOEHL
Temperature	none	170.1	Brooks AFB	AFOEHL
Volatile Halocarbons	H_2SO_4	601	Brooks AFB	AFOEHL
Volatile Aromatics	H_2SO_4	602	Brooks AFB	AFOEHL

III. RESULTS

A. Lagoon Characterization Survey

1. Introduction - This section presents contaminant concentrations and physical and chemical parameters which characterize the influent to the lagoons, the lagoon sediment, and the dissolved oxygen levels.

2. Flow - The AFOEHL team was unable to measure the flow at the lift stations during the survey because of the need for specialized equipment in the extremely deep sewage system. Consequently, the best available flow data is from CE records of a special survey in 1988. Appendix E shows this data. The base measured 397,400 gallons/day flowing through building 1336 on 30-31 Mar 88. They measured 388,300 gallons flowing through building 801 on 8-9 Dec 88.

3. Analytical results - Appendix F, Wastewater Characterization Analyses Results, shows the complete results for all sites. Unusual results are presented below.

Site 2: We measured boron levels at 0.8 mg/l in the second 24-hour period composite sample. The average of both sample day's phenol was 0.0155 mg/l. Analysis showed 0.0028 mg/l of toluene in the first day's sample. Analysis showed no pesticides or halogenated hydrocarbons.

Site 3: Analyses showed the presence of cyanide averaging 0.0075 mg/l. Phenols averaged 0.157 mg/l. The first days samples also detected 0.0048 mg/l of chloroform, 0.004 mg/l methylene chloride, 0.0045 mg/l tetrachloroethylene, and 0.0026 mg/l ethyl benzene. Analyses showed no pesticides.

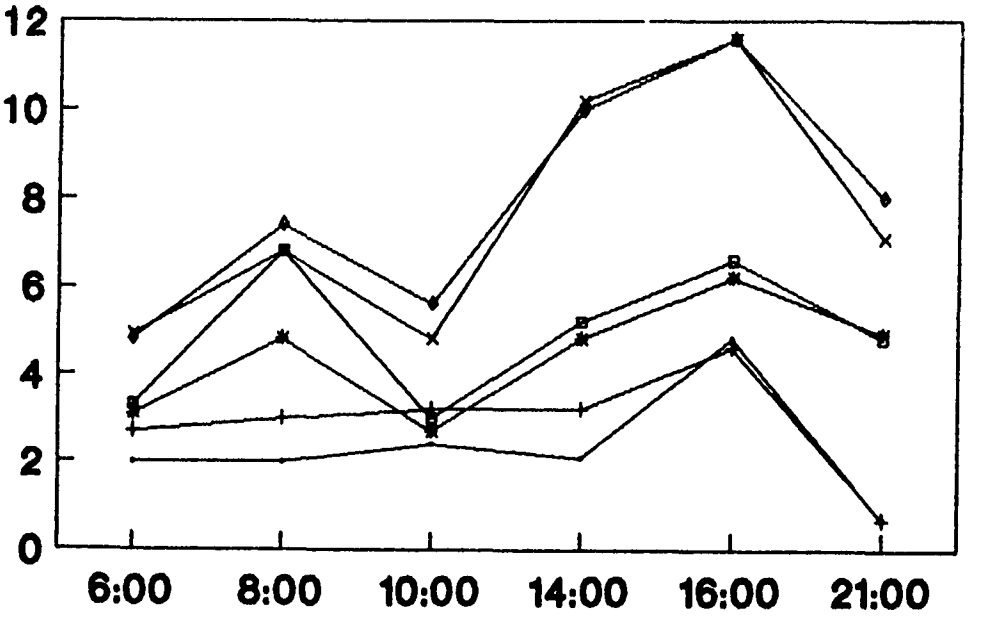
4. Extraction Procedure (EP) Analysis. An AFOEHL contractor performed EP extraction and characteristic hazardous waste analysis on samples from all locations. EP extraction analysis of all lagoon sediment sites indicated no detectable levels of arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D, or silvex (2,4,5-TP). Appendix G, Characteristic Hazardous Waste Analyses, shows the results.

5. Dissolved Oxygen. Dissolved oxygen levels ranged from 0.7 mg/l to 11.6 mg/l throughout the day (Appendix H). Figure 2 shows a graph of the results of the dissolved oxygen sampling. Sites with an "A" shredout were sampled near the lagoon surface. Anoxic conditions probably occur in Cell 1 (Site 6 and 6A) between 2100 and 0600. Cells 2 (Sites 14 and 14A) and 3 (Sites 21 and 21A) appear to be aerobic throughout the day and night.

B. Storm Drainage System

1. Site 1. These results are shown in both Appendix F and Appendix G. The stream samples showed an average boron level of 1.4 mg/l--approximately twice the North Dakota Class II stream limitation of 0.75 mg/l. Phosphates slightly exceeded the stream standard, averaging 0.125 mg/l compared to the 0.1 mg/l standard. Phenol analysis showed 0.043 mg/l on the first day and 0.010 mg/l on the second day. The first days levels exceeded

LAGOON DISSOLVED OXYGEN



SITE 6	2	2	2.4	2.1	4.8	0.7
SITE 6A	2.7	3	3.2	3.2	4.6	0.7
SITE 14	3.1	4.8	2.7	4.8	6.2	4.9
SITE 14A	3.3	6.8	3	5.2	6.6	4.8
SITE 21	4.9	6.8	4.8	10.2	11.6	7.1
SITE 21A	4.8	7.4	5.6	10	11.6	8

TIME (24-HOUR CLOCK)

SITE 6 SITE 6A SITE 14
SITE 14A SITE 21 SITE 21A

NOTE: 30 AUG 89,TEMP 16-21C, A.M.CLOUDS

Figure 2. Lagoon Dissolved Oxygen

the stream standard of 0.01 mg/l. Chemical oxygen demand levels rose from 15 mg/l to 238 mg/l from the first to the second day's composite sample. Finally, analysis showed trace levels of methylene chloride, 0.0008 mg/l, in the stormwater.

2. EP Extraction Analyses. EP extraction of the stream bed sediment showed no detectable levels of arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D, or silvex (2,4,5-TP).

IV. CONCLUSIONS

A. Lagoon Characterization

1. Influent parameters.

The analytical results for the lagoon treatment plant input (sites 2 and 3) were generally representative of domestic wastewater as shown in Table 3.

Table 3. Comparison Of Lagoon Influent And Typical Domestic Sewage[1]

CONSTITUENT	TYPICAL RANGE	INFLUENT RANGE
Chemical Oxygen Demand	100-1000 mg/l	120-230 mg/l
Oil & Grease	50-150 mg/l	33.6-126 mg/l
Total Kejdahl Nitrogen	28-120 mg/l	14.5-26 mg/l
Total Dissolved Solids	250-850 mg/l	702-946 mg/l

[1]Metcalf & Eddy, Inc. (1972). "Wastewater Engineering: Collection, Treatment, Disposal." McGraw-Hill, New York

Other chemicals in the lagoon influent included boron, phenols, toluene, cyanide, chloroform, methylene chloride, and ethyl benzene. North Dakota regulates phenol, boron and cyanides in their Class II stream permits. The following is a discussion of each chemical separately:

Increased boron levels are most likely coming from detergents and soaps; however, other sources include photo processing chemicals. While the boron influent ranged from 0.3 mg/l to 0.8 mg/l, we measured boron levels within the lagoon to be from 0.9 mg/l to 3.0 mg/l--four times the North Dakota Class II standard of 0.75 mg/l. The lagoon treatment process is slightly increasing the concentration levels of boron as evaporation occurs with no corresponding reduction in boron levels.

Phenol is a designated hazardous substance under the Clean Water Act, and listed as a toxic substance subject to general pretreatment regulations for new and existing sources. Phenol levels from the south lift station measured 9 to 22 times the Class II stream limits. The lagoon treatment process probably removes a large percentage of phenol through

volatilization. The probable source of phenol is detergents or disinfectants being used at the hospital and other places around the base.

Hydrogen cyanide, sodium cyanide, and potassium cyanide are designated hazardous substances and subject to pretreatment standards. Total cyanides in the south lift station influent averaged 0.0075 mg/l, slightly over the Class II stream limitations of 0.007 mg/l. Analysis showed a concentration over five times the stream standard (0.027 mg/l) in Cell 1. Possible sources of cyanide include pesticides, hospital laboratories, and photo-developing processes.

Chloroform is designated a hazardous substance by the Clean Water Act and is listed as a toxic pollutant subject to general pretreatment regulations for new and existing sources. Chloroform is used as an industrial solvent in pesticides.

Methylene chloride is listed as a toxic pollutant, subject to general pretreatment regulations for new and existing sources and to effluent guidelines and standards under the Clean Water Act. Methylene chloride was detected in both the main gate stormwater and the south lift sanitary samples at levels of 0.8 ppb and 4.5 ppb, respectively. Methylene chloride is widely used in a variety of processes including paint stripping and metal degreasing. It may also be found in paint removers and home products.

Ethyl benzene is designated as a hazardous substance by the Clean Water Act and as a toxic pollutant subject to general pretreatment regulations for new and existing sources. The most likely source of ethyl benzene would be dilution with xylene as xylene may contain as much as 20% ethyl benzene as a solvent or diluent. These mixtures are normally found in painting operations, some agricultural sprays for insecticides and in gasoline blends.

Toluene is also a hazardous substance and toxic pollutant under the Clean Water Act. It is a common carrier for paint pigments of all kinds and may also be found as a component of motor and aviation fuels. Its introduction into the sanitary system could be from painting operations.

2. EP Analyses. EP analyses show the lagoon sediment is not considered hazardous waste.

3. Dissolved Oxygen. While they do not seriously degrade the waste treatment process, anoxic conditions in the primary lagoon cell may create undesirable odor problems. Should these problems occur, base civil engineers can alleviate them by aerating the primary lagoon.

B. Storm Drainage System. Despite significant recent precipitation, the effluent from the main gate exceeded state standards for boron and phosphates. Phenols and methylene chloride were identified. EP toxicity results showed no detectable levels.

V. RECOMMENDATIONS

A. Lagoon

1. Boron and phenol. Investigate and reduce boron and phenol levels entering the lagoon system. The best method of reducing boron and phenol levels introduced into the sanitary system is source control and minimization. Evaluate vehicle and aircraft washracks and auto-hobby wash areas for excessive use of soaps, improper dilution methods, excessive floor washings, etc. Check NDI and base photo lab chemicals for boron content. Check civil engineering and corrosion control for compounds containing phenolics. Substitute products which do not contain boron and phenols where possible.

Table 4. Boron Concentrations In Soaps And Photographic Chemicals

COMPOUND	BORON(MG/L)
Soap NSN 7930 00068 1669	6.5
Soap NSN 7930 00177 5217	4.5
Soap NSN 7930 00958 6033	3.7
Soap NSN 7930 00985 6904	40(mg/gm)
Soap NSN 6850 01184 3182	21
Typical NDI Developer	230
Typical NDI Fixer	950
Fultron Developer	3,000
Hospital x-ray Developer	970
Hospital x-ray Fixer	5,000
Audio Visual B&W Developer	1,900
Audio Visual B&W Fixer	1,700

Note: Percentages will vary by manufacturer. Check each MSDS by manufacturer.

2. Lagoon Influent Monitoring. Incorporate cyanide, chloroform, methylene chloride, tetrachloroethylene, and ethyl benzene into the AFR 19-7 base environmental sampling program for the lagoon influent. Investigate the source of contamination and eliminate.

3. Lagoon Effluent Monitoring. Begin monitoring cyanide when the lagoons are emptied as part of the AFR 19-7 base sampling program.

4. Toxicity Characteristic Leaching Procedure (TCLP) Sampling. Take screening samples of lagoon sediment for analysis under the new Toxicity Characteristics rule. The Toxicity Characteristic Leaching Procedure (TCLP) was published in the Mar 21, 1990 Federal Register (55FR 11798) and replaces the Extraction Procedure (EP) used during this survey. The procedure provides that a waste is hazardous if it contains a concentration equal to or greater than a regulated level for 25 organic chemicals. Of the unusual chemicals detected in the lagoon influent, chloroform and tetrachloroethylene are 2 of the 25 regulated chemicals. Sediment samples require 500 gms in a widemouth,

glass container with a Teflon lid. The MAJCOM must provide funds for analytical costs which will be approximately $2,000 per sample.

B. Storm Drainage System

1. Boron and Cyanide. Investigate the boron and cyanide sources (see paragraph A 1 above). The large variability of phenol concentrations on the two days indicates introduction of the chemical into the storm system probably occurs as the result of a specific process.

2. Phosphates. Investigate and eliminate the source of phosphate. Phosphates are commonly associated with a variety of commercial and industrial soaps.

Appendix A
Survey Request Letter With Attachment

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA 68113-5001

REPLY TO ATTN. OF: SGPB

16 March 1989

SUBJECT: Request for Environmental and Hazardous Waste Survey

TO: USAFOEHL/CC

We support the attached request from Grand Forks AFB for the requested on-site OEHL/ECQ support visit. This summer would be the best time to conduct this survey. The 842 Strategic Hospital point of contact for the survey is Lt England, AV 362-5598. Please coordinate your staff visit with her if you are able to support this request. Please let the 842 Strategic Hospital/SGPB and us know if you can support this request.

Ronald L. Schiller

RONALD L. SCHILLER, Colonel, USAF, BSC
Chief, Bioenvironmental Engineering Division
Office of the Surgeon

1 Atch
842 Strat Hosp/SGPB
Ltr, 6 Mar 89

cc: 842 Strat Hosp/SGPB
w/o Atch
HQ AFSC/SGPB
USAFOEHL/ECQ

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8104-14
89-0413

DEPARTMENT OF THE AIR FORCE
842D STRATEGIC HOSPITAL (SAC)
GRA...D FORKS AIR FORCE BASE, NORTH DAKOTA 582... 5000

REPLY TO ATTN. OF: SGPB

6 Mar 89

SUBJECT: Request for Environmental and Hazardous Waste Survey

TO: HQ SAC/SGPB
USAFOEH[L]/ECQ (Major Ng)
IN TURN

1. We request an environmental consultant visit to quantify storm drainage effluents (wastewater characterization survey) at Grand Forks AFB, ND. Also, we request a hazardous waste survey of this facility while the consultant team is on base. The results of the surveys will be used to pinpoint sources of contamination and supplement grab sampling data gathered during past years. Guidance is also sought on the proper management of our sewage lagoons.

2. Grand Forks AFB has a storm drainage system with seven outfall points exiting the base. They are not permitted, however, the waters are regulated by the State of North Dakota. The hazardous waste disposal and monitoring program is adequate, however, there is concern about the existence of additional areas and quantities generated at non-industrial locations. Our current lagoon system does have some industrial wastes entering its waters. We need to determine if this presents a large problem to the lagoon system itself.

3. Bioenvironmental Engineering staffing is at 77% and is anticipated to fall further or remain steady. Our office currently has only one composite sampling device. To adequately accomplish a survey of this size, we feel additional support is required.

4. Please contact me at AV 362-5598 for further information.

ELLEN C. ENGLAND, 1st Lt, USAF, BSC
Chief, Bioenvironmental Engineering

cc: 842 CSG/DEEV

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Appendix B
Grand Forks AFB National Pollutant
Discharge Elimination System Permit

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO 80295

Ref: 8WM-C

January 31, 1985

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Hal Miller
Base Environmental Coordinator
321 CSG/DEEV
Grand Forks Air Force Base
Grand Forks, North Dakota 58205

Dear Mr. Miller:

Herewith enclosed is the NPDES permit for Grand Forks Air Force Base, ND-0020621. This permit shall become effective and issued thirty (30) days following your receipt of this letter unless, within thirty (30) days following the date of receipt, you submit a request for an evidentiary hearing in accordance with the provisions of 40 CFR Section 124.74. Such request must be addressed to:

Regional Administrator (8A)
U.S. Environmental Protection Agency
Region VIII, Suite 280
1860 Lincoln Street
Denver, Colorado 80295

If you have any legal questions with regard to this matter, please contact the Regional Counsel's office at (303) 293-1457. Questions regarding monitoring requirements should be directed to Lawrence Sheehan at (303) 293-1589.

Sincerely yours,

Max H. Dodson
Director
Water Management Division

Enclosures

NPDES Discharge Permit
EPA Form 3320-1 for reporting self-monitoring

Permit No. ND-0020621

Effective Date: Date of Issuance*

Expiration Date: September 30, 1989

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et. seq.) (hereinafter referred to as "the Act"),

the United States Air Force, 321st Combat Support Group, Grand Forks Air Force Base,

is authorized by the United States Environmental Protection Agency,

to discharge from the sewage lagoon system at Grand Forks Air Force Base to a drainage ditch tributary to Kelly's Slough; from the dewatering well for the missile training facility at Grand Forks Air Force Base to a storm sewer tributary to Kelly's Slough; and from the sewage lagoon systems at 15 separate launch control facilities located in Cavalier, Grand Forks, Griggs, Nelson, Ramsey, Steel, Walsh and Barnes Counties, North Dakota to various intermittent drainageways,

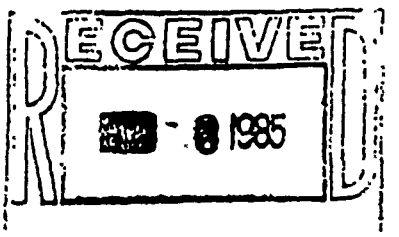
in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III, hereof.

Max H Dodson — January 31, 1985

Authorized Permitting Official — Date

Max H. Dodson
Director
Water Management Division
Title

*Thirty (30) days after the date of receipt of this permit by the Applicant.



DESCRIPTION OF DISCHARGE POINTS:

Outfall No.	Description of Discharge
001a	This is the discharge from Cell No. 2 of the sewage lagoon system at Grand Forks Air Force Base.
001b	This is one of two discharge points from Cell No. 3 of the sewage lagoon system at Grand Forks Air Force Base. It is located closer to Cell No. 2 than is discharge 001c.
001c	This is one of two discharge points from Cell No. 3 of the sewage lagoon system at Grand Forks Air Force Base. It is located further from Cell No. 2 than is discharge 001b.
002	This is the lift station overflow located at the intersection of County Road No. 3 and the main gate entrance (Building 801).
003	This is the lift station overflow located at the intersection of 7th Avenue and "J" Street (Building 122).
004	This is the lift station overflow located at the intersection of "J" Street and Teak Street (Building 1336).
005	This is the discharge from a well located near a missile training silo at Grand Forks Air Force Base. The well is used for lowering the water table to control seepage into the silo. This discharge was previously permitted under NPDES Permit No.. ND-0023906.

Outfalls 006 through 020 are for discharges from 15 small sewage lagoon systems that serve remote Minute Man launch control facilities at various locations in North Dakota. Normally, there is not a discharge from these facilities, but they are permitted in case there is a need to discharge. These discharge points were previously permitted under NPDES Permit No.: ND-0023914.

DISCHARGE LOCATIONS - LAUNCH CONTROL FACILITIES - 321 CIVIL ENGINEERING SQUADRON:

Outfall No. :	Launch Control Facility (LCF)	Location	Lagoon Overflow Point
006	A-O	SW¼ Section 26, T162N, R61W, Cavalier County	Farm agricultural land
007	B-O	SE¼ Section 18, T161N, R58W, Cavalier County	Same as Above
008	C-O	SE¼ Section 35, T159N, R57W, Cavalier County	Same as Above
009	D-O	SW¼ Section 34, T159N, R60W, Cavalier County	Same as Above
010	E-O	NW¼ Section 30, T158N, R62W, Ramsey County	Same as Above
011	F-O	SE¼ Section 33, T156N, R59W, Walsh County	Same as Above
012	G-O	SE¼ Section 17, T154N, R56W, Grand Forks County	Same as Above
013	H-O	SW¼ Section 4, T153N, R58W, Nelson County	Same as Above
014	I-O	SW¼ Section 35, T151N, R60W, Nelson County	Same as Above
015	J-O	SE¼ Section 14, T154N, R61W, Ramsey County	Same as Above
016	K-O	SW¼ Section 20, T148N, R55W, Steel County	Same as Above
017	L-O	SW¼ Section 33, T145N, R57W, Steel County	Same as Above
018	M-O	SE¼ Section 19, T144N, R55W, Steel County	Same as Above
019	N-O	NW¼ Section 8, T143N, R59W, Barnes County	Same as Above
020	O-O	NE¼ Section 1, T146N, R59W, Griggs County	Same as Above

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - SEE ANY ADDITIONAL REQUIREMENTS UNDER PART III

Effluent Limitations - Outfalls 001a, 001b, and 001c:

Effective immediately and lasting through September 30, 1989, the quality of effluent discharged by the facility shall, as a minimum, meet the limitations as set forth below:

No discharge shall occur from the subject facility unless and until permission for such discharge is granted by the State of North Dakota Department of Health. In the event such permission is granted by the Department, the permittee shall comply with the effluent limitations specified below. In addition, there shall be no visible floating solids. The limitations apply to each discharge.

Average Effluent Concentration

Parameter	30-Consecutive Day Period	7-Consecutive Day Period
BOD_5, mg/L	25 a/	45 b/
Total Suspended Solids, mg/L	30 a/	45 b/
Fecal Coliform, no./100 mL	200 c/	400 c/

There shall be no measurable concentrations of Total Residual Chlorine in the discharge unless written authorization has been granted by the permit issuing authority. If authorization is granted, the concentration of Total Residual Chlorine shall not exceed the amount specified in that authorization.

The concentration of Oil and Grease shall not exceed 10 mg/L in any grab sample nor shall there be a visible sheen or floating oil in the discharge.

pH, units — Shall remain between 6.0 and 9.0 d/

a/ This limitation shall be determined by the arithmetic mean of a minimum of three (3) consecutive samples taken on separate weeks in a 30-day period (minimum total of three (3) samples); not applicable to Fecal Coliforms - see footnote c/.

b/ This limitation shall be determined by the arithmetic mean of a minimum of three (3) consecutive samples taken on separate days in a 7-day period (minimum total of three (3) samples); not applicable to Fecal Coliforms - see footnote c/.

c/ Averages for Fecal Coliform shall be determined by the geometric mean of a minimum of three (3) consecutive grab samples taken during separate weeks in a 30-day period for the 30-day average, and during separate days in a 7-day period for the 7-day average (minimum total of three (3) samples).

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - SEE ANY ADDITIONAL REQUIREMENTS UNDER PART III (Continued)

1. Effluent Limitations - Outfalls 001a, 001b, and 001c: (Continued)

d/ Any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit.

2. Effluent Limitations - Outfalls 002, 003, and 004:

Effective immediately and lasting through September 30, 1989, there shall be no discharge except in accordance with the bypass provisions specified in Parts II and III of this permit.

3. Effluent Limitations - Outfall 005:

Effectively immediately and lasting through September 30, 1989, the quality of effluent discharged shall, as a minimum, meet the limitations as set forth below:

The discharge shall consist solely of groundwater pumped from the area near the missile training facility. No chemicals shall be added to the water.

The concentration of Total Suspended Solids in the discharge shall not exceed 50 mg/L in any grab sample.

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - SEE ANY ADDITIONAL REQUIREMENTS UNDER PART III (Continued)

4. Effluent limitations - Outfalls 006 through 020:

Effective immediately and lasting through September 30, 1989, the quality of effluent discharged by the facility shall, as a minimum, meet the limitations as set forth below:

No discharge shall occur from the subject facility unless and until permission for such discharge is granted by the State of North Dakota Department of Health. In the event such permission is granted by the Department, the permittee shall comply with the effluent limitations specified below. In addition, there shall be no visible floating solids and/or visible Oil or Grease in the discharge.

	Average Effluent Concentration	
Parameter	30-Consecutive Day Period	7-Consecutive Day Period
BOD_5, mg/L	25 a/	45 b/
Total Suspended Solids, mg/L	30 a/	45 b/
Fecal Coliform, no./100 mL	200 c/	400 c/
pH, units	Shall remain between 6.0 and 9.0. d/	

a/ This limitation shall be determined by the arithmetic mean of a minimum of three (3) consecutive samples taken on separate weeks in a 30-day period (minimum total of three (3) samples); not applicable to Fecal Coliforms - see footnote c/.

b/ This limitation shall be determined by the arithmetic mean of a minimum of three (3) consecutive samples taken on separate days in a 7-day period (minimum total of three (3) samples); not applicable to Fecal Coliforms - see footnote c/.

c/ Averages for Fecal Coliform shall be determined by the geometric mean of a minimum of three (3) consecutive grab samples taken during separate weeks in a 30-day period for the 30-day average, and during separate days in a 7-day period for the 7-day average (minimum total of three (3) samples).

d/ Any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Continued)

5. Self-Monitoring Requirements - Outfalls 001 (a,b, & c) and 006 through 020

a. Applicable when the permittee is requesting permission to discharge.

Prior to the start of any discharge from any of the lagoon systems, the permittee shall collect a grab sample from each lagoon cell from which it is desired to discharge the water and have the sample analyzed for the following parameters:

BOD_5, mg/L
Total Suspended Solids, mg/L
pH, s.u.
Fecal Coliforms, no./100 mL
Ammonia Nitrogen, mg/L a/

The results of the analyses, along with a request to discharge, shall be submitted to the North Dakota State Department of Health. The request to discharge shall explain why a discharge is needed, when the discharge would start, the expected duration of the discharge, and the approximate volume of water to be discharged. No discharge shall occur until permission has been granted by the North Dakota State Department of Health. The North Dakota Game and Fish Department and the USDI, Fish and Wildlife Service, Area Office - North Dakota are to be notified of the request for permission to discharge.

b. Applicable when a discharge is occurring.

During periods of discharge, the permittee shall, as a minimum, monitor the discharge for the parameters listed below at the frequencies and with the types of samples indicated. The samples and measurements shall be representative of the volume and nature of the monitored discharge. If both Outfalls 001b and 001c are being used at the same time, only one has to be monitored.

a/ Monitoring for Ammonia Nitrogen required only for Outfalls 001 (a,b, & c).

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Continued)

5. Self-Monitoring Requirements (Continued)

b. Applicable when a discharge is occurring. (Continued)

Parameter	Frequency	Sample Type
BOD_5, mg/L	a/	Grab
Total Suspended Solids, mg/L	a/	Grab
pH, s.u.	Twice Weekly b/	Grab
Fecal Coli orms, no./100 mL	a/	Grab
Oil and Grease - Visual	Twice Weekly b/	Visual Observation
Ammonia Nitrogen, mg/L d/	Weekly	Grab
Total Residual Chlorine, mg/L (Monitoring not required if do not chlorinate)	Daily	Grab
Duration of Discharge	c/	c/
Total Volume Discharged	c/	c/

a/ The discharge shall be monitored a minimum of three (3) times for this parameter unless the discharge lasts two (2) days or less, then samples shall be collected daily. If the discharge is expected to last two (2) weeks or less, the first three (3) samples shall be collected on separate days during the first week of the discharge and then samples shall be collected at least once a week for the duration of the discharge. If the discharge is expected to last more than two (2) weeks, at least one sample shall be collected each week, with a minimum of three (3) samples being collected and analyzed. The permittee is responsible for anticipating the duration of the discharge and collecting the minimum number of samples as specified above.

b/ The discharge is to be monitored for pH and Oil and Grease on the first day of the discharge and at least twice weekly thereafter for the duration of the discharge.

c/ The date and time of the start and termination of each discharge shall be reported. In addition, the approximate volume discharged (in million gallons) during each reporting period and during the entire discharge shall be reported. This shall be done for each discharge that occurs. If no discharge occurs during the reporting period, "no discharge" shall be reported.

Monitoring for Ammonia Nitrogen required only for Outfalls 001 (a,b, & c).

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Continued)

6. Self-Monitoring Requirements - Discharge 005:

As a minimum, the following parameters shall be monitored at the frequency and with the type of measurement indicated; samples of measurements shall be representative of the volume and nature of the monitored discharge. The permittee shall monitor his discharge(s) as shown below. If no discharge occurs during the monitoring period, "no discharge" shall be reported.

Parameter	Frequency	Type of Measurement
Flow Rate, MGD	Quarterly	Instantaneous a/
Total Suspended Solids, mg/L	Quarterly	Grab

a/ The flow rate may be estimated from pump discharge curves or other appropriate methods.

B. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by, the permit issuing authority.

2. Reporting

Monitoring results obtained during the previous 3 month(s) shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on April 28, 1985. If no discharge occurs during the reporting period, "no discharge" shall be reported. Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

U.S. Environmental Protection Agency
Suite 280, 1860 Lincoln Street
Denver, Colorado 80295
Attention: Water Management Division
Compliance Branch (8WM-C)

North Dakota Department of Health
Missouri Office Building
1200 Missouri Avenue
Bismarck, North Dakota 58501

In addition, copies of self-monitoring reports for discharges from the Grand Forks Air Force Base sewage lagoon system (Outfalls 001(a,b, & c)). shall be sent to the U.S. Fish and Wildlife Service at the following addresses:

Refuge Manager
Devils Lake Wetland
Management District
Box 908
Devils Lake, North Dakota 58301

U.S. Fish and Wildlife Service
Field Supervisor
1500 Capitol Avenue
Bismarck, North Dakota 58501

3. Definitions

a. A "composite" sample, for monitoring requirements, is defined as a minimum of four (4) grab samples collected at equally spaced two (2) hour intervals and proportioned according to flow.

B. MONITORING AND REPORTING (Continued)

3. Definitions (continued)

b. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

c. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(h) of the Act, under which such procedures may be required.

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and,

e. The results of all required analyses.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit, including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation, shall be retained for a minimum of three (3) years, or longer, if requested by the Regional Administrator or the State Water Pollution Control Agency.

A. MANAGEMENT REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and,

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

A. MANAGEMENT REQUIREMENTS (Continued)

5. Bypassing (See Additional Requirements Under PART III)

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of waste waters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. Power Failures

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the waste water control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

b. Take such precautions as are necessary to maintain and operate the facility under his control in a manner that will minimize upsets and insure stable operation until power is restored.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the head of the State Water Pollution Control Agency, the Regional Administrator, and/or their authorized representative, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State Water Pollution Control Agency.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State Water Pollution Control Agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or,

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

B. RESPONSIBILITIES (Continued)

5. Toxic Pollutants

Notwithstanding Part II, B.4. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Severability

The provisions of this permit are severable and, if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

OTHER REQUIREMENTS

Bypass of Treatment Facilities

1. Definitions

   a. "Bypass" means the diversion of waste streams from any portion of a treatment facility.

   b. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. Prohibition of Bypass

   Any bypass is prohibited and the permit issuing authority may take enforcement action against a permittee for bypassing, unless:

   a. The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and,

   b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance.

3. Authorized Bypass

   a. If, for any reasons, a partial or complete bypass is considered necessary, a request for such bypass shall be submitted to the State of North Dakota and to the United States Environmental Protection Agency at least sixty (60) days prior to the proposed bypass. If the proposed bypass is judged acceptable to the State of North Dakota and by the United States Environmental Protection Agency, the bypass will be allowed subject to limitations imposed by the State and the United States Environmental Protection Agency.

   b. If, after review and consideration, the proposed bypass is determined to be unacceptable by the State and by the United States Environmental Protection Agency, or if limitations imposed on the approved bypass are violated, such bypass shall be considered a violation of this permit; and the fact that application was made, or that a partial bypass was approved, shall not be a defense to any action brought thereunder.

OTHER REQUIREMENTS (Continued)

Bypass of Treatment Facilities (Continued)

3. Authorized Bypass (Continued)

   c. The sixty (60) day period referred to in subparagraph a. may be reduced or waived at the discretion of the permit issuing authority.

4. Notification for Unauthorized Bypasses

   a. The permittee shall provide immediate (within 24 hours) oral notification of any bypass which may endanger health or the environment.

   b. All bypasses not specifically authorized under Paragraph 3. of this Section are subject to the notification requirements of Part II, Section A.2., Noncompliance Notification, of this permit.

Reapplication

If the permittee desires to continue to discharge, he shall reapply, at least one hundred eighty (180) days before this permit expires, using the application forms then in use. The permittee should also reapply if he desires to maintain a permit, even though there was not a discharge from the treatment facilities during the duration of this permit.

Staffing and Laboratory

Efficient facility operation contained in Part II, A.3., of this permit shall include, but not be limited to, adequate operator staffing and training as well as adequate laboratory and process controls.

Inventory of Industrial Waste Waters

Within one year after the effective date of this permit, the permittee shall submit to the United States Environmental Protection Agency and the North Dakota State Department of Health an inventory of industrial and maintenance operations that have floor drains connected into the sanitary sewer system. Those operations where the waste water is solely of domestic nature (e.g., mess halls) do not have to be included in the inventory. The following information shall be provided for each operation listed in the inventory:

a. Name of the operation;

b. A brief description of the operation and the sources of the waste water discharged to the sanitary sewer system;

c. A list of chemicals used in the operation;

d. A brief description of any treatment of the waste water prior to discharge to the sanitary sewer system;

e. A brief description of management practices or policies that are being used to minimize the introduction of toxic or hazardous pollutants into the sewer system from that operation; and,

f. An estimate of the average and maximum daily volumes of waste water discharged to the sanitary sewer system.

If the inventory shows that industrial wastes subject to categorical pretreatment requirements are being discharged to the sanitary sewer system or that other industrial wastes containing toxic or hazardous pollutants are not being adequately pretreated prior to being discharged to the sanitary sewer system, this permit may be modified to require the appropriate pretreatment and/or monitoring of those industrial wastes.

ADDITIONAL INSTRUCTIONS FOR SAMPLE FORM.

1. This is a sample form only.

2. This report requires no carbon, therefore please bear down on pen when completing the report.

3. Those effluent limitations indicated under permit condition's may not necessarily be the limits which are indicated on your permit. You must check your permit to determine the limitations which apply.

4. Monitor only those parameters specified in the monitoring section of your permit. The sample report includes those parameters most often required of municipalities; however, your permit may be different.

5. The frequency of sampling and the type of sample to be collected are specified in your permit for each parameter. Those shown on the "sample" report are typical.

6. Please be sure to include your NPDES number in the space provided and a valid telephone number in the lower right hand corner.

7. Please read the instructions on the back of the self-monitoring forms and call (303) 837-4335, if you have questions.

8. IF NO DISCHARGE OCCURS, PLEASE REPORT <u>NO DISCHARGE</u>.

SAMPLE FORM

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

SAMPLE FORM

Form Approved
OMB No. 158 R0073

NAME PERMITTEE NAME
ADDRESS STREET ADDRESS
CITY-STATE-ZIP

FACILITY
LOCATION

PERMIT NUMBER | DISCHARGE NUMBER

MONITORING PERIOD
FROM YEAR MO DAY TO YEAR MO DAY

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
FLOW	SAMPLE MEASUREMENT			MGD	******	******	******				
	PERMIT REQUIREMENT				******	******	******			CONT	
pH	SAMPLE MEASUREMENT	******	******	STANDARD UNITS		******		STANDARD UNITS			
	PERMIT REQUIREMENT	******	******		6.0	******	9.0				GRAB
BOD_5	SAMPLE MEASUREMENT			LB/DAY OR KG/DAY				MG/L			
	PERMIT REQUIREMENT	******	******		******	30	45				COMP
Percent Removal BOD_5	SAMPLE MEASUREMENT	******	******					%		******	****
	PERMIT REQUIREMENT	******	******		85	******	******			******	****
Total Suspended Solids	SAMPLE MEASUREMENT			LB/DAY OR KG/DAY				MG/L			
	PERMIT REQUIREMENT	******	******		******	30	45				COMP
Percent Removal Suspended Solids	SAMPLE MEASUREMENT	******	******					%		******	****
	PERMIT REQUIREMENT	******	*****		85	******	******			******	****
Coliforms (Fecal or Total)	SAMPLE MEASUREMENT	******	******					N/100ML			
	PERMIT REQUIREMENT	******	******		******	200	400				GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER — TYPED OR PRINTED

THIS DOCUMENT IS SIGNED WITH RECOGNITION THAT KNOWINGLY MAKING A FALSE CERTIFICATION ON THIS REPORT OR [illegible] OR INTENTIONALLY TAMPERING WITH ANY MONITORING DEVICE OR METHOD ARE CRIMINAL OFFENSES. SEE [illegible] 1001 AND 33 U.S.C. §1319. [illegible]

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE | NUMBER

DATE: YEAR | MO | DAY

[illegible] AND EXPLANATION OF ANY VIOLATIONS [illegible]

[illegible] PREVIOUS EDITION [illegible] WHICH MAY NOT BE USED.) PAGE OF

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Appendix C
Standards for Water Quality for State of North Dakota (Extracts)

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STANDARDS OF WATER QUALITY
FOR
STATE OF NORTH DAKOTA

RULE 33-16-02

NORTH DAKOTA STATE DEPARTMENT OF HEALTH
And Consolidated Laboratories
STATE CAPITOL • BISMARCK, N. DAK.

STANDARDS OF WATER QUALITY
FOR
STATE OF NORTH DAKOTA

RULE 33-16-02

ADOPTED BY
NORTH DAKOTA STATE HEALTH COUNCIL
JANUARY 16, 1985

EFFECTIVE DATE

MAY 1, 1989

ISSUED BY

NORTH DAKOTA STATE DEPARTMENT OF HEALTH
HEALTH AND CONSOLIDATED LABORATORIES
ROBERT M. WENTZ, M. D., STATE HEALTH OFFICER

PREPARED UNDER THE SUPERVISION
OF
GENE A. CHRISTIANSON, M. S., R. P. E., CHIEF

OPINION

ATTORNEY GENERAL

STATE OF NORTH DAKOTA
State Capitol
Bismarck, North Dakota 58505

701-224-2210

Nicholas J Spaeth
ATTORNEY GENERAL

Capitol Offices
Consumer Fraud and Antitrust Division
701-224-3404
800-472-2600
Toll Free in ND

Criminal Justice Training and Statistics Division
701-224-2594

Fire Marshal
701-224-2424

Gaming Division
701-224-4848

Licensing Division
701-224-3219

Division Offices
Bismarck, ND 58502

Bureau of Criminal Investigation
P O Box 1054
701-221-6180
800-472-2185
Toll Free in ND

Drug Enforcement Unit
P O Box 993
701-221-6186
800-472-2185
Toll Free in ND

January 16, 1989

Mr. Bill Delmore
Assistant Attorney General
North Dakota State Department of
Health and Consolidated Laboratories
State Capitol
Bismarck, ND 58505

Dear Mr. Delmore:

We have examined the proposed amendments to chapter 33-16-02 of the North Dakota Administrative Code (Standards of Water Quality).

These administrative rules are in compliance with N.D.C.C. § 28-32-02 and are hereby approved as to their legality. Upon final adoption, these rules may be filed with Legislative Council

Sincerely,

Nicholas J. Spaeth

vkk
cc: Katherine Chester Ver Weyst

CHAPTER 33-16-02
STANDARDS OF WATER QUALITY FOR STATE OF NORTH DAKOTA

33-16-02-01. Antidegradation policy. The state of North Dakota, in accordance with the 1972 Federal Water Pollution Control Act, as amended, declares that state and public policy is to maintain or improve, or both, the quality and purity of the waters of this state. These standards are established for the protection of public health and enjoyment of these waters, to ensure the propagation and well-being of fish, wildlife, and all biota associated or dependent upon said waters, and to safeguard social, economical, and industrial development associated with this resource. The waters of the state include all surface and ground waters of the state as defined in North Dakota Century Code section 61-28-01 and those rivers, streams, and lakes forming boundaries between this state and other states or Canada. All known and reasonable methods to control and prevent pollution of the waters of this state are required, including improvement in water quality, when feasible.

The portion of the statement of policy contained in North Dakota Century Code section 61-28-01 which reads as follows, is a part of this chapter:

> It is hereby declared to be the policy of the state of North Dakota to act in the public interest to protect, maintain, and improve the quality of the waters in the state for continued use as public and private water supplies, propagation of wildlife, fish and aquatic life, and for domestic, agricultural, industrial, recreational, and other legitimate beneficial uses, to require necessary and reasonable treatment of sewage, industrial, or other wastes.

It is the purpose of this chapter to maintain and improve the quality of waters in the state and to maintain and protect existing

water uses. The "quality of the waters" shall be the quality of record existing at the time the first standards were established in 1967, or later records if these indicate an improved quality in certain waters. Waters whose existing quality is higher than the established standards will be maintained at the higher quality unless it can be affirmatively demonstrated, after full satisfaction of the intergovernmental coordination and public participation provisions of the continuing planning process, that a change in quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing the lowering of water quality, the department shall assure existing uses are fully protected and that the highest statutory and regulatory requirements for all point sources and all cost effective and reasonable best management practices for nonpoint sources are achieved.

Waters of unique or high quality characteristics that may constitute an outstanding national resource must be maintained and protected.

Any industrial, public, or private project or development other than municipal which constitutes a source of pollution shall provide the best degree of treatment as designated by the department in the North Dakota pollutant discharge elimination system. Municipal wastes are required to meet the effluent requirements as noted in subsection 3 of section 33-16-02-04. The environmental protection agency will be kept advised and provided with the information needed to perform its responsibilities under the Federal Water Pollution Control Act, as amended.

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-02. Definitions.

1. "Acute standard" means the one-hour average concentration does not exceed the listed concentration more than once every three years on the average.

2. "Best management practices (BMPs)" are methods, measures, or procedures selected by the department to control nonpoint source pollution. Best management practices include, but are not limited to, structural and nonstructural measures and operation and maintenance procedures.

3. "Chronic standard" means the four-day average concentration does not exceed the listed concentration more than once every three years on the average.

4. "Consecutive thirty-day average" is the average of samples taken during any consecutive thirty-day period, but not a requirement for thirty consecutive daily samples.

5. "Department" means the North Dakota state department of health and consolidated laboratories.

6. A standard defined as "dissolved" means the total quantity of a given material present in a filtered water sample, regardless of the form or nature of its occurrence.

7. "Pollution" means such contamination; or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters; or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to public health, safety, or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish, or other aquatic biota.

8. "Site specific standard" means water quality criteria developed to reflect local environmental conditions to protect the uses of a specific water body.

9. A standard defined as "total" means the total quantity of a given material present in an unfiltered water sample regardless of the form or nature of its occurrence. This includes both dissolved and suspended forms of a substance, including the total amount of the substance present as a constituent of the particulate material.

10. "Water usage". The best usage for the waters shall be those uses determined to be the most consistent with present and potential uses in accordance with the economic and social development of the area. Present principal best uses are those defined in subdivisions a, b, c, and d, but are not to be construed to be the only possible usages permitted.

    a. Agricultural uses. Water suitable for irrigation, stock watering, and other agricultural uses, but not suitable for use as a source of domestic supply for the farm unless satisfactory treatment is provided.

    b. Industrial water. Waters that are suitable for industrial purposes, including food processing, after treatment. Treatment may include that necessary for prevention of boiler scale and corrosion.

    c. Municipal and domestic water. Waters that are suitable for use as a source of water supply for drinking and culinary purposes after treatment to a level approved by the state department of health and consolidated laboratories.

d Recreation, fishing, and wildlife. Waters that are suitable for the propagation or support of fish and other aquatic biota; that will not adversely affect wildlife in the area; and are suitable for boating and swimming. (Natural high turbidities in some waters and physical characteristics of banks and streambeds of many streams are factors that limit their value for bathing. Low flows or natural physical and chemical conditions in some waters may limit their value for fish propagation or aquatic biota.)

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-03. Variances. Where, upon written application by the responsible discharger, the department finds that by reason of substantial and widespread economic and social impacts the strict enforcement of state water quality criteria is not feasible, the department can permit a variance. The department can set conditions and time limitations with the intent that progress toward improvements in water quality will be made. The United States environmental protection agency will be advised of such variances and informed as to the need. A variance will be granted only after public notification and comment and environmental protection agency approval. The provisions set forth in section 33-16-02-04 will apply to all permitted discharges. A variance will not preclude an existing or designated beneficial use.

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-04. General requirements. The following are general requirements for all waste discharges:

1. No untreated domestic sewage shall be discharged into the waters of the state.

2. No untreated industrial wastes or other wastes which contain substances or organisms which may endanger public health or degrade the water quality or water usage shall be discharged into the waters of the state.

3. The degree of treatment for municipal wastes shall be that required by the department and shall be based on the following:

   a. Municipal wastes are to receive a minimum of secondary treatment or equivalent which shall be equal to at least an eighty-five percent removal of five-day biochemical oxygen demand, or shall meet the effluent standards noted

in subdivision c. The more restrictive requirements shall apply.

b. Wastes shall be effectively disinfected before discharge into state waters if such discharges cause violation of the fecal coliform criteria as set forth in these standards.

c. No municipal waste discharge shall be permitted unless the effluent meets the following criteria:

(1) Five-day biochemical oxygen demand: Twenty-five milligrams per liter consecutive thirty-day average.

(2) Suspended solids: Thirty milligrams per liter consecutive thirty-day average.

(3) Fecal coliform: Fecal coliform not to exceed two hundred per one hundred milliliters consecutive thirty-day average.

In certain instances, external circumstances or specific uses of the receiving waters make either attainment or application of the suspended solids or fecal coliform limitations an ineffective means of controlling water quality. For this reason, the department reserves the right to evaluate the application of these limitations on a case-by-case basis.

(4) pH: Six through nine point zero.

Natural ground water and surface waters in some parts of the state, presently used for water supplies with or without treatment, are basic and the stabilization process of wastewater treatment in lagoon systems can result in more alkaline (increased pH) water. Discharges from waste treatment facilities may exceed the upper pH limit due to these uncontrollable properties. Approval to discharge may be granted providing the pH of the receiving water is not violated.

d. The department may require additional treatment than that listed in this section if such waste discharges, made during low stream flows, cause violations of stream water quality standards, or have a detrimental effect on the beneficial uses of the receiving waters.

4. Industrial waste effluents shall meet all parameters of quality as set forth under the North Dakota pollutant discharge elimination system and shall not violate North Dakota water quality standards.

5. This department must be notified at least twenty days prior to the application of any herbicide or pesticide to surface waters of the state for control of aquatic pests.

   The notification must include the following information:

   a. Chemical name and composition.

   b. Map which identifies the area of application and number of square feet.

   c. A list of target species of aquatic biota the applicant desires to control.

   d. The calculated concentration of active ingredient in surface waters immediately after application.

   e. Name, address, and phone number of the certified applicator.

6. Any spill or discharge of waste which causes or is likely to cause pollution of waters of the state must be reported immediately. The owner, operator, or person responsible for a spill or discharge must notify the department as soon as possible (701-224-2354) or the North Dakota hazardous materials emergency assistance and spill reporting number (1-800-472-2121) and provide all relevant information about the spill. Depending on the severity of the spill or accidental discharge, the department may require the owner or operator to:

   a. Take immediate remedial measures;

   b. Determine the extent of pollution to waters of the state;

   c. Provide alternate water sources to water users impacted by the spill or accidental discharge; or

   d. Any other actions necessary to comply with this chapter.

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-05. General conditions. The following minimum conditions are applicable to all waters of the state except for class II ground waters.

All waters of the state shall be:

1. Free from substances attributable to municipal, industrial, or other discharges or agricultural practices that will cause the

formation of putrescent or otherwise objecticnable sludge deposits.

2. Free from floating debris, oil, scum, and other floating materials attributable to municipal, industrial, or other discharges or agricultural practices in sufficient amount to be unsightly or deleterious.

3. Free from materials attributable to municipal, industrial, or other discharges or agricultural practices producing color, odor, or other conditions in such a degree as to create a nuisance or render any undesirable taste to fish flesh, or in any way, make fish inedible.

4. Free from substances attributable to municipal, industrial, or other discharges or agricultural practices in concentrations or combinations which are toxic or harmful to human, animal, plant, or resident aquatic biota. This standard will be enforced by use of the procedures referenced in subsection 3 of section 33-16-02-07.

5. Free from oil or grease residue attributable to wastewater, which causes a visible film or sheen upon the waters or any discoloration of the surface of adjoining shoreline or causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines or prevents classified uses of such waters.

6. There shall be no materials such as garbage, rubbish, offal, trash, cans, bottles, or any unwanted or discarded material disposed of into the waters of the state.

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-06. Specific standards of quality for designated classes of surface waters of the state. The following standards are prescribed as specific water quality for designated classes of surface waters to protect beneficial water uses as set forth in the following water use descriptions and classifications.

It is recognized that during certain periods of the year, some waters may contain certain natural chemical, physical, and biological characteristics or properties equaling or exceeding the limits set forth in these standards. The department may use the natural background level as the standard for any particular parameters and as a base for controlling the addition of wastes from controllable sources. When the flow in the stream is less than the ten-year, seven-day low flow level, the department reserves the right to make a case-by-case evaluation of application of these standards. However, no substances shall be present

in concentrations or combinations that materially interfere with, or that prove hazardous to, the intended water usage.

The magnitude of any specific parameter violation or the intrinsic nature and potential damage caused by any specific parameter violation will be considered by the department in evaluating whether a single parameter violation shall result in administrative action.

1. Class I streams. The quality of waters in this class shall be such as to permit the propagation or life, or both, of resident fish species and other aquatic biota and shall be suitable for boating, swimming, and other water recreation. The quality shall be such that after treatment consisting of coagulation, settling, filtration, and chlorination, or equivalent treatment processes, the treated water shall meet the bacteriological, physical, and chemical requirements of the department for municipal use. The quality of water shall be such as to permit its use for irrigation, stock watering, and wildlife use without injurious effects.

   The following substances, unless stated otherwise, are maximum limits not to be exceeded. The requirements of this class of water shall be as follows:

Storet Code	Substance or Characteristic	Maximum Limit
39330	Aldrin (Total)	Acute 3.0 ug/l .
00612	Ammonia (un-ionized) as (N) (Diss.) **	The NH_3-N in mg/l concentration resulting from intermittent waste discharges cannot exceed the numerical value given by .427/FT/FPH/2 where: .
		$FT = 10^{0.03(20-TCAP)}$; $TCAP \leq T \leq 30$
		$10^{0.03(20-T)}$; $0 \leq T \leq TCAP$
		$FPH = 1$; $8 \leq pH \leq 9$
		$\frac{1 + 10^{7.4-pH}}{1.25}$; $6.5 \leq pH \leq 8$
		TCAP = 20 C; salmonids or other sensitive cold water species present
		= 25 C; salmonids and other sensitive cold water species absent
		The NH_3-N in mg/l concentration from a continuous waste discharge cannot

		exceed the numerical value given by .658/FT/FPH/Ratio where: Ratio = 16 ; $7.7 \leq pH \leq 9$ = $24. \frac{10^{7.7-pH}}{1+10^{7.4-pH}}$; $6.5 \leq pH \leq 7.7$ TCAP = 15 C; salmonids or other sensitive cold water species present = 20 C; salmonids and other sensitive cold water species absent
01002	Arsenic (Total)	.05 mg/l
01007	Barium (Total)	1.0 mg/l
01022	Boron (Total)	.75 mg/l
01027	Cadmium (Total) **	The one-hour average concentration in ug/l cannot exceed the numerical value given by $e^{(1.128[\ln(\text{hardness as mg/l})] -3.828)}$ more than once every 3 years on the average. The four-day average concentration in ug/l cannot exceed the numerical value given by $e^{(.7852[\ln(\text{hardness as mg/l})] -3.490)}$ more than once every 3 years on the average.
00940	Chlorides (Total)	100 mg/l
39350	Chlordane (Total)	Acute 2.4 ug/l Chronic .0043 ug/l
01034	Chromium (Total) **	.05 mg/l
01042	Copper (Total) **	The one-hour average concentration in ug/l cannot exceed the numerical value given by $e^{(.9422[\ln(\text{hardness as mg/l})] -1.464)}$ more than once every 3 years on the average. The four-day average concentration in ug/l cannot exceed the numerical value given by $e^{(.8545[\ln(\text{hardness as mg/l})]}$

		$-1.465)$ more than once every 3 years on the average.
00720	Cyanides (Total)	.005 mg/l
00300	Dissolved Oxygen	not less than 5 mg/l
39380	Dieldrin (Total)	Acute 2.5 ug/l Chronic .002 ug/l
39388	Endosulfan (Total)	Acute .22 ug/l Chronic .06 ug/l
39390	Endrin (Total)	Acute .18 ug/l Chronic .0023 ug/l
31616	Fecal Coliform	200 fecal coliforms per 100 ml. This standard shall apply only during the recreation season May 1 to September 30.
39410	Heptachlor (Total)	Acute .52 ug/l Chronic .004 ug/l
01051	Lead (Total) **	The one-hour average concentration in ug/l cannot exceed the numerical value given by $e^{(1.266[\ln(\text{hardness as mg/l})]-1.416)}$ more than once every 3 years on the average. The four-day average concentration in ug/l cannot exceed the numerical value given by $e^{(1.266[\ln(\text{hardness as mg/l})]-4.661)}$ more than once every 3 years on the average.
39782	Lindane (Hexachloro-cyclohexane)	Acute 2.0 ug/l Chronic .06 ug/l
71900	Mercury (Total)	Acute 2.4 ug/l Chronic .012 ug/l
00618	Nitrates (N) (Diss.) *	1.0 mg/l
39032	Pentachlorophenol ***	Acute 20.0 ug/l Chronic 13.0 ug/l
00400	pH	7.0-9.0
32730	Phenols (Total)	.01 mg/l
00665	Phosphorus (P) (Total) *	0.1 mg/l

39516	Polychlorinated Biphenyls (Total)	Acute 2.0 ug/l Chronic .014 ug/l
01147	Selenium (Total)	.01 mg/l
01077	Silver (Total) **	The one-hour average concentration in ug/l cannot exceed the numerical value given by $e^{(1.72[\ln(\text{hardness as mg/l})]-6.52)}$ more than once every 3 years on the average.
00932	Sodium	50 percent of total cations as mEq/l
00945	Sulfate (Total) as SO_4	250 mg/l
00010	Temperature	Eighty-five degrees Fahrenheit [29.44 degrees Celsius]. The maximum increase shall not be greater than five degrees Fahrenheit [2.78 degrees Celsius] above natural background conditions.
50060	Total Chlorine Residual	Acute .019 mg/l Chronic .011 mg/l
39400	Toxaphene (Total)	Acute .73 ug/l Chronic .0002 ug/l
01092	Zinc (Total) **	The one-hour average concentration in ug/l cannot exceed the numerical value given by $e^{(.8473[\ln(\text{hardness as mg/l})]+.8604)}$ more than once every 3 years on the average. The four-day average concentration in ug/l cannot exceed the numerical value given by $e^{(.8473[\ln(\text{hardness as mg/l})]+.7614)}$ more than once every 3 years on the average.
11503	Combined radium 226 and radium 228 (Total)	5 pCi/L
01519	Gross alpha particle activity including radium 226 but excluding radon and uranium	15 pCi/L

* The standards for nitrates (N) and phosphorus (P) are intended as interim guideline limits. Since each stream or lake has unique characteristics which determine the levels of these constituents that will cause excessive plant growth (eutrophication), the department reserves the right to review these standards after additional study and to set specific limitations on any waters of the state. However, in no case shall the standard for nitrates (N) exceed ten milligrams per liter for any waters used as a municipal or domestic drinking water supply.

** More restrictive criteria than specified may be necessary to protect fish and aquatic biota. These criteria will be developed according to the procedures in subdivision b of subsection 2 of section 33-16-02-07.

*** Limitation is a pH dependent calculated value using the formula $e^{[1.005(pH)-5.29]}$; pH = 7.8 was used for listed value as an example. For exact limitation, receiving water pH value must be used.

2. Class IA streams. The quality of this class of waters shall be such that its uses shall be the same as those identified for class I, except that treatment for municipal use may also require softening to meet the chemical requirements of the department. The physical and chemical criteria shall be those for class I, with the following exceptions:

Storet Code	Substance or Characteristic	Maximum Limit
00940	Chlorides (Total)	175 mg/l
00932	Sodium	60% of total cations as mEq/l.
00945	Sulfates (Total)	450 mg/l

3. Class II streams. The quality of this class of waters shall be such that its uses shall be the same as those identified for class I, except that additional treatment may be required over that noted in class IA to meet the drinking water requirements of the department.

Streams in this classification may be intermittent in nature which would make some of these waters of questionable value for beneficial uses, such as irrigation, municipal water supplies, or fish life. The physical and chemical criteria shall be those for class IA, with the following exceptions:

Storet Code	Substance or Characteristic	Maximum Limit
00940	Chlorides (Total)	250 mg/l
00400	pH	6.0-9.0

4. Class III streams. The quality of this class of waters shall be suitable for industrial and agricultural uses, i.e. cooling, washing, irrigation, and stock watering. These streams all have low average flows, and generally, prolonged periods of no flow and are of marginal or seasonal value for immersion recreation and fish aquatic biota. The quality of the water must be maintained to protect recreation, fish, and aquatic biota. The physical and chemical criteria shall be those for class II, with the following exceptions:

Storet Code	Substance or Characteristic	Maximum Limit
00945	Sulfate (Total)	750 mg/l

5. Wetlands. These water bodies are to be considered waters of the state and will be protected under section 33-16-02-05.

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-07. Miscellaneous provisions.

1. Mixing zones. The general conditions in section 33-16-02-05 apply in the mixing zone. The size and configurations of a mixing zone cannot be uniformly prescribed for all streams due to the particular characteristics of each stream. However, the following considerations are to be taken into account when mixing zones are determined:

   a. The water quality standards[1] must be met at every point outside of the mixing zone. The department may require a means of expediting mixing and dispersion of wastes, if found necessary.

   b. The total mixing zone (or zones) at any cross-sectional area of the stream should not be larger than twenty-five percent of the cross-sectional area or volume of flow and shall not extend more than fifty percent of the width. Mixing zones shall provide an acceptable passageway for movement of fish and other aquatic organisms.

   c. No acute toxicity resulting in mortality of aquatic biota will be allowed within a mixing zone.

d. Mixing zones shall be as small as possible and shall not intersect spawning or nursery areas, migratory routes, or municipal water intakes. Overlapping of mixing zones should be avoided or minimized to prevent adverse synergistic effects.

2. Sampling and testing.

a. All methods of sample collection, preservation, and analyses used in applying any of the provisions of this chapter shall be in accord with those prescribed in the latest edition of "Standard Methods for the Examination of Water and Wastewater", published by the American public health association, or in accordance with tests or analytical procedures that have been found to be equal or more applicable by the department or the environmental protection agency.

b. Bioassay tests shall be performed in accordance with procedures outlined in the latest edition of "Standard Methods for the Examination of Water and Wastewater" published by the American public health association, or in accordance with tests or analytical procedures that have been found to be equal or more applicable by the department or the environmental protection agency. Bioassay studies shall be made using a sensitive resident species.

3. Site specific criteria. If the department determines more restrictive or site specific, or both, numeric criteria are necessary for a point source discharge to protect aquatic biota, the procedures outlined in the 1983 United States environmental protection agency publication "Water Quality Standards Handbook, Chapter 4, Guidelines for Deriving Site Specific Water Quality Criteria" or the United States environmental protection agency publication "Quality Criteria for Water 1986" (the gold book) will be utilized to determine maximum limits.

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-08. Stream classification. The following intrastate and interstate streams are classified as the class of water quality which is to be maintained in the specified stream or segments noted. There are a number of minor or intermittently flowing watercourses, unnamed creeks, or draws, etc., which are not listed. All waters not specifically listed shall be governed in accordance with section 33-16-02-05. All tributaries not specifically mentioned are classified as class III streams.

River Basins, Subbasins, and Tributaries	Classification
Missouri River, including Lake Sakakawea and Oahe Reservoir	I
Yellowstone	I
Little Muddy Creek near Williston	II
White Earth River	II
Little Missouri River	II
Knife River	II
Spring Creek	IA
Square Butte Creek below Nelson Lake	IA
Heart River	IA
Green River	IA
Antelope Creek	II
Muddy Creek	II
Apple Creek	II
Cannonball River	II
Cedar Creek	II
Beaver Creek near Linton	II
Grand River	IA
Spring Creek	II
Souris River	IA
Des Lacs River	II
Willow Creek	II
Deep River	III
Mauvais Coulee	I
James River	IA
Pipestem	IA
Cottonwood Creek	II
Beaver Creek	II
Elm River	II
Maple River	II
Bois de Sioux	I
Red River	I
Wild Rice River	II
Antelope Creek	III
Sheyenne River	IA

Baldhill Creek	II
Maple River	II
Rush River	III
Elm River	II
Goose River	IA
Turtle River	II
Forest River	II
North Branch	III
Park River	II
North Branch	III
South Branch	II
Middle Branch	III
Cart Creek	III
Pembina River	IA
Tongue River	II

History: Amended effective May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-09. Lake classification. The following lakes are classified according to the water characteristics which are to be maintained in the specified lakes. The beneficial water uses and parameter limitations designated for class I streams shall apply to all classified lakes. However, specific background studies and information may require that the department revise a standard for any specific parameter which may diverge from those listed for class I streams. Lake standard revisions are subject to the same process as stream standard revisions.

In addition, it is intended that these nutrient parameter guidelines be used as a goal in any lake improvement or maintenance program:

Parameter	Limit
NO_3 as N	.25 mg/l
PO_4 as P	.02 mg/l

The temperature standard for class I streams does not apply to Nelson Lake in Oliver County. The temperature of any discharge to Nelson Lake shall not have an adverse effect on fish, aquatic life, and wildlife, or Nelson Lake itself.

1. Numerical classification. The numerical classification refers to the type of fishery a lake may be capable of supporting based on the lake's geophysical characteristics. However, the capability of the lake to support a fishery may be affected by seasonal variations or other natural occurrences which may alter the lake characteristics.

CLASS	CHARACTERISTICS
1	Cold water fishery. Waters capable of supporting growth of salmonid fishes and associated aquatic biota.
2	Cool water fishery. Waters capable of supporting growth and propagation of nonsalmonid fishes and marginal growth of salmonid fishes and associated aquatic biota.
3	Warm water fishery. Waters capable of supporting growth and propagation of nonsalmonid fishes and associated aquatic biota.
4	Marginal fishery. Waters capable of supporting a fishery on a seasonal basis.
5	Not capable of supporting a fishery due to high salinity.

2. Individual classification.

County	Lake	Classification
Adams	Mirror	3
Adams	N. Lemmon	1
Barnes	Ashtabula	3
Barnes	Heinze	3
Barnes	Moon	2
Barnes	Clausen Spring	1
Benson	Wood Lake	2
Benson	Graves	3

Benson	Reeves	3
Bottineau	Metigoshe	2
Bottineau	Long Lake	2
Bottineau	Pelican	3
Bottineau	Carbury	2
Bottineau	Cassidy	3
Bottineau	Strawberry	2
Bowman	Bowman-Haley	3
Bowman	Gascoyne	3
Bowman	Kalina	3
Bowman	Spring Lake	3
Burke	Powers Lake	3
Burke	Short Creek	2
Burke	Smishek	2
Burke	Traux Mine	1
Burke	Northgate	2
Burke	Bowbells Mine	1
Burleigh	McDowell Dam	3
Burleigh	New John's Lake	2
Cass	Casselton Reservoir	3
Cass	Hunter Dam	3
Cass	Brewer Lake	2
Cavalier	Mt. Carmel	2
Dickey	Moores Lake	1
Dickey	Pheasant	3
Dickey	Wilson Dam	3
Divide	Skjermo	2

Dunn	Lake Ilo	3
Eddy	Warsing Dam	2
Emmons	Braddock Dam	3
Emmons	Hieuwsma Dam	2
Emmons	Rice Lake	4
Emmons	Welk Dam	3
Foster	Juanita	3
Golden Valley	Camel Hump	1
Golden Valley	Odland Dam	3
Golden Valley	Williams Creek	4
Grand Forks	Fordville	2
Grand Forks	Larimore	2
Grand Forks	Kolding	2
Grant	Tschida	2
Grant	Raleigh Reservoir	4
Grant	Sheep Creek	2
Griggs	Red Willow	3
Griggs	Carlson-Tande	3
Hettinger	Larson Lake	3
Hettinger	Kilzer	3
Hettinger	Castle Rock	1
Hettinger	Indian Creek	3
Hettinger	Mott Dam	2
Hettinger	Blickensderfer	2
Kidder	Cherry Lake	2
Kidder	Crystal Springs	3

Kidder	Frettum Lake	2
Kidder	Round Lake	2
Kidder	Lake Williams	2
Kidder	Lake Isabel	3
Kidder	George Lake	5
LaMoure	Schlect-Weis	3
LaMoure	Hein.-Martin	2
LaMoure	Kulm-Edgeley	2
LaMoure	Cottonwood	4
LaMoure	Kalmbach	4
LaMoure	Schlect-Thom	2
LaMoure	Lake LaMoure	2
Logan	Beaver Lake	3
Logan	Mundt Lake	2
Logan	Rudolph Lake	4
McHenry	Cottonwood	3
McHenry	George Lake	2
McHenry	Round Lake	3
McHenry	Buffalo Lodge	3
McIntosh	Blumhardt	1
McIntosh	Coldwater	2
McIntosh	Green Lake	2
McIntosh	Lake Hoskins	2
McIntosh	Clear Lake	2
McKenzie	Arnegard Dam	4
McKenzie	Sather Dam	2
McLean	Brush Lake	3

McLean	W. Park Lake	2
McLean	E. Park Lake	2
McLean	Brekken	2
McLean	Holmes	2
McLean	Lightning	2
McLean	Crooked Lake	2
McLean	Custer Mine	1
McLean	Audubon	2
McLean	Strawberry	3
McLean	Long Lake	4
McLean	Riv. Spillway	1
Morton	Crown Butte	3
Morton	Fish Creek	1
Morton	Sweetbriar	3
Morton	Nygren	3
Morton	Lanz[illegible]	3
Mountrail	Clearwater	3
Mountrail	White Earth	2
Mountrail	Stanley Reservoir	3
Nelson	McVille Dam	1
Nelson	Whitman Dam	1
Nelson	Tolna Dam	2
Oliver	Nelson Lake	3
Oliver	Van Oosting	3
Oliver	M. Mosbrucker	2
Oliver	A. Mosbrucker	1

Oliver	E. Arroda Lake	1
Oliver	W. Arroda Lake	1
Pembina	Renwick Dam	2
Pierce	Balta Dam	2
Pierce	Buffalo Lake	2
Ramsey	Devils Lake	3
Ramsey	Cavanaugh	3
Ransom	Dead Colt Creek	3
Renville	Lake Darling	2
Richland	Lake Elsie	2
Richland	Hooreton Pond	2
Rolette	Carpenter	2
Rolette	Dion Lake	2
Rolette	Gravel Lake	1
Rolette	Gordon	2
Rolette	Hooker Lake	1
Rolette	Belcourt	2
Rolette	School Section	2
Rolette	Upsilon	3
Rolette	Shutte Lake	2
Sargent	Alkali Lake	3
Sargent	Silver Lake	2
Sargent	Tewaukon	3
Sargent	Buffalo Lake	4
Sargent	Sprague Lake	3
Sheridan	Hecker	2
Sheridan	S. McClusky	2

Sioux	Froelich	2
Slope	Cedar Lake	3
Slope	Davis Dam	1
Slope	Hamann Dam	1
Slope	Stewart Lake	3
Stark	Patterson	3
Stark	Dickinson Dike	2
Stark	Belfield Pond	3
Steele	N. Tobiason	3
Steele	Golden Lake	3
Steele	N. Golden Lake	3
Stutsman	Jamestown Reservoir	2
Stutsman	Clark Lake	3.
Stutsman	Jim Lake.	3
Stutsman	Spiritwood	2
Stutsman	Arrowwood	4
Stutsman	Krapp Dam	2
Stutsman	Barnes Lake	3
Stutsman	Pipestem Reservoir	3
Towner	Armourdale	2
Walsh	Hatejcek	1
Walsh	Bylin Dam	2
Walsh	Homme Dam	2
Ward	North Carlson	2
Ward	Rice Lake	2
Ward	Velva Sptsm.	1

Wells	Harvey Dam	3
Wells	Lake Hiawatha	4
Williams	Blacktail	3
Williams	Epp.-Springbrook	2
Williams	Iverson	2
Williams	Kota-Ka	1
Williams	McCloud	3
Williams	McGregor	1
Williams	Tioga Reservoir	2
Williams	Williston Park	4
Williams	Cottonwood	3
	Oahe	1
	Sakakawea	1

History: Amended effective March 1, 1985; May 1, 1989.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02-10. Specific standards of quality for designated classes of ground waters of the state. The following standards are prescribed as specific water quality for designated classes of ground waters in order to protect present and future beneficial uses.

1. Classification of ground water.

   a. Class I ground water. Class I ground waters are ground waters with a total dissolved solids concentration of less than ten thousand milligrams per liter and which are not exempt under the North Dakota underground injection control program in section 33-25-01-05.

   b. Class II ground water. Class II ground waters are ground waters with a total dissolved solids concentration of ten thousand milligrams per liter or greater or are exempt under the North Dakota underground injection control program in section 33-25-01-05.

2. Ground water quality standards.

a. Class I. Discharges into class I ground waters shall not cause concentrations of dissolved or suspended substances to exceed the criteria set forth in North Dakota Century Code chapter 61-28.1, which sets the maximum allowable chemical, radiological, and microbiological contaminant levels for drinking water.

b. Class II. Discharges into class II ground waters shall not cause concentrations of dissolved or suspended substances to exceed levels which allow the waters to be harmful or detrimental to human health or adversely affect existing or future beneficial uses.

History: Effective May 1, 1985.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

Appendix D
Site/Analysis Summary

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SITE ANALYSIS SUMMARY

PARAMETERS	SITE 1 DAY 1	SITE 1 DAY 2	SITE 2 DAY 1	SITE 2 DAY 2	SITE 3 DAY 1	SITE 3 DAY 2	SITE 6 DAY 1	SITE 14 DAY 1	SITE 21 DAY 1
TOTAL SUSP. SOLIDS (RESIDUE NON-FILETERABLE)	X						X		
pH		X	X	X	X	X	X	X	X
BORON	X	X	X	X	X	X	X	X	X
CYANIDES	X	X	X	X	X	X	X	X	X
PHOSPHATES P	X	X	X	X	X	X	X	X	X
PHENOLS	X	X	X	X	X	X	X	X	X
COD	X	X	X	X	X	X	X	X	X
PETROLEUM HYDROCARBONS	X	X	X	X	X	X			
TKN	X	X	X	X	X	X			
TOT DISS SOLIDS FILTERABLE RESIDUE	X	X	X	X	X	X			
mBASAS LAS SURFACTANT MBAS	X	X	X	X	X	X	X	X	X
TOTAL ALK	X	X	X	X	X	X	X	X	X
CHLOROFORM	X				X			X	X
1,2-DICHLORETHENE CIS/TRANS	X		X						
METHYLENE CHLORIDE	X				X				
TETRACHLORO-ETHYLENE	X				X				
ETHY-BENZENE	X								
TOLUENE	X		X						
2,4,5-T	X	X	X	X	X	X	X	X	X

OIL & GREASE	X	X	X	X	X	X			
ENDRIN	X	X	X	X	X	X	X	X	X
METHOXYCLOR	X	X	X	X	X	X	X	X	X
TEXAPHENE	X	X	X	X	X	X	X	X	X
2,4-D	X	X	X	X	X	X	X	X	X
SILVEX (2,4,5-TP)	X	X	X	X	X	X	X	X	X

Appendix E
Lift Station Flow Records

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FLOW TESTING FOR BUILDING 1336 SITE 3
DATA TAKEN 30 MARCH 88 (0900) TO 31 MARCH 88 (0900)

TIME	MINUTES PUMP ON	GPM/ 1/2 HR	GALLONS
0900-0930	22.00	366.67	11000.00
0930-1000	22.00	366.67	11000.00
1000-1030	19.10	318.33	9550.00
1030-1100	21.00	350.00	10500.00
1100-1130	21.80	363.33	10900.00
1130-1200	22.70	378.33	11350.00
1200-1230	20.50	341.67	10250.00
1230-1300	19.90	331.67	9950.00
1300-1330	21.60	360.00	10800.00
1330-1400	21.70	361.67	10850.00
1400-1430	21.60	360.00	10800.00
1430-1500	17.80	296.67	8900.00
1500-1530	18.60	310.00	9300.00
1530-1600	16.10	268.33	8050.00
1600-1630	17.40	290.00	8700.00
1630-1700	15.00	250.00	7500.00
1700-1730	17.40	290.00	8700.00
1730-1800	21.20	353.33	10600.00
1800-1830	20.90	348.33	10450.00
1830-1900	22.90	381.67	11450.00
1900-1930	22.90	381.67	11450.00
1930-2000	22.40	373.33	11200.00
2000-2030	21.90	365.00	10950.00
2030-2100	22.80	380.00	11400.00
2100-2130	19.10	318.33	9550.00
2130-2200	22.00	366.67	11000.00
2200-2230	20.60	343.33	10300.00
2230-2300	18.80	313.33	9400.00
2300-2330	21.00	350.00	10500.00
2330-2400	13.60	226.67	6800.00
2400-0030	12.30	205.00	6150.00
0030-0100	9.90	165.00	4950.00
0100-0130	8.70	145.00	4350.00
0130-0200	8.20	136.67	4100.00
0200-0230	5.60	93.33	2800.00
0230-0300	4.50	75.00	2250.00
0300-0330	5.20	86.67	2600.00
0330-0400	5.10	85.00	2550.00
0400-0430	4.70	78.33	2350.00
0430-0500	4.60	76.67	2300.00
0500-0530	5.50	91.67	2750.00
0530-0600	5.70	95.00	2850.00
0600-0630	7.00	116.67	3500.00
0630-0700	12.90	215.00	6450.00
0700-0730	19.30	321.67	9650.00
0730-0800	25.70	428.33	12850.00
0800-0830	24.20	403.33	12100.00
0830-0900	19.40	323.33	9700.00
	AVG GPM	275.97	TOTAL GPD 397400

FLOW TESTING FOR BUILDING 801 SITE 2
DATA TAKEN 8 DEC 87 (0900) TO 9 DEC 88 (0900)

TIME	MINUTES PUMP ON	GPM /1/2 HR	GALLONS
0900-0930	14.80	246.67	7400.00
0930-1000	13.60	226.67	6800.00
1000-1030	15.30	255.00	7650.00
1030-1100	16.95	282.50	8475.00
1100-1130	17.15	285.83	8575.00
1130-1200	19.10	318.33	9550.00
1200-1230	21.00	350.00	10500.00
1230-1300	17.20	286.67	8600.00
1300-1330	19.70	328.33	9850.00
1330-1400	17.10	285.00	8550.00
1400-1430	18.60	310.00	9300.00
1430-1500	18.60	310.00	9300.00
1500-1530	15.40	256.67	7700.00
1530-1600	20.00	333.33	10000.00
1600-1630	16.70	278.33	8350.00
1630-1700	18.00	300.00	9000.00
1700-1730	19.90	331.67	9950.00
1730-1800	20.80	346.67	10400.00
1800-1830	20.90	348.33	10450.00
1830-1900	18.30	305.00	9150.00
1900-1930	21.00	350.00	10500.00
1930-2000	17.60	293.33	8800.00
2000-2030	17.60	293.33	8800.00
2030-2100	16.10	268.33	8050.00
2100-2130	16.10	268.33	8050.00
2130-2200	16.70	278.33	8350.00
2200-2230	15.20	253.33	7600.00
2230-2300	16.10	268.33	8050.00
2300-2330	19.40	323.33	9700.00
2330-2400	12.80	213.33	6400.00
2400-0030	14.30	238.33	7150.00
0030-0100	11.40	190.00	5700.00
0100-0130	11.10	185.00	5550.00
0130-0200	8.80	146.67	4400.00
0200-0230	8.40	140.00	4200.00
0230-0300	8.10	135.00	4050.00
0300-0330	7.90	131.67	3950.00
0330-0400	7.90	131.67	3950.00
0400-0430	8.00	133.33	4000.00
0430-0500	9.30	155.00	4650.00
0500-0530	7.80	130.00	3900.00
0530-0600	8.80	146.67	4400.00
0600-0630	11.60	193.33	5800.00
0630-0700	20.30	338.33	10150.00
0700-0730	29.20	486.67	14600.00
0730-0800	28.00	466.67	14000.00
0800-0830	24.00	400.00	12000.00
0830-0900	24.00	402.00	12060.00
	AVG GPM	269.65	TOTAL GPD 388300

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Appendix F
Wastewater Characterization
Analyses Results

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PARAMETERS	UNITS	SITE 1 MAIN GATE DAY 1	SITE 1 MAIN GATE DAY 2	SITE 2 NORTH LIFT (BLDG 801) DAY 1	SITE 2 NORTH LIFT (BLDG 801) DAY 2	SITE 3 SOUTH LIFT (BLDG 3136) DAY 1	SITE 3 SOUTH LIFT (BLDG 3136) DAY 2	SITE 6 CELL 1	SITE 14 LAGOONS CELL 2	SITE 21 CELL 3
VISIBLE FLOATING SOLIDS		N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O
FLOATING OIL & GREASE	mg/L	1.444						28		
TOTAL SUSPENDED SOLIDS (RESIDUE NONFILTERABLE)		7.6	7.6	7.8	7.8	7.3	7.7	7.3	7.8	7.8
pH		1.6	1.2	0.3	0.3	0.5	0.4	0.9	1.3	3
(DIS) Boron	mg/L	0.005	0.005	<0.005	<0.005	0.007	0.008	0.027	0.0005	.0008
(TOTAL) CYANIDES	mg/L	0.12	0.13	5.7	5.7	7.7	7.5	6.5	2	2.6
PHOSPHORAS as (DISSOL) PHOSPHATES P	mg/L	0.043	0.010	0.015	0.016	0.222	0.09?			
PHENOLS	mg/L	400	260	300	260	220	300	300	300	520
SULFATES	mg/L	15	238	120	120	210	230	155	60	85
CHEMICAL OXYGEN DEMAND	mg/L	0.6	1.4	38.2	33.6	66	126			
OIL & GREASE	mg/L	<1.0	<1.0	9.1	9.6	20	33.6			
PETROLEUM HYDROCARBONS	mg/L	3.4	3.5	17.5	14.5	20	26	17.5	6.6	9.4
TOTAL KEJLDALBL NITROGEN	mg/L	1353	1065	946	872	702	780	872	978	1584
TOTAL DISSOLVED SOLIDS	mg/L	0.1	0.1	1.3	1.2	14	19	0.4	0.3	0.4
mBASAS LAS SURFACTANTS	mg/L	275	225	195	200	230	245	245	255	325
TOTAL ALKALINITY	mg/L		1099	950	968		921		1094	1670
TOTAL RESIDUE	mg/L	<0.0001				0.0048		<0.0001	<0.0001	<0.0001
CHLOROFORM		<0.0001		0.0086					<0.0001	
1,2 DICHLOROETHENE	mg/L	0.0008	0.0008	*		0.0045		<0.0001	<0.0001	
METHYLENE CHLORIDE		<0.0001	<0.0001	*						
TETRACHLORO-ETHYLENE		<0.0001	<0.0001	*		0.0026				
ETHYL-BENZENE		<0.0001	<0.0001	0.0028		<0.0001				
TOLUENE		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4-D	ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-T	ug/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SILVEX	ug/L	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
TOXAPHENE	ug/L	<0.02	<0.02	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
ENDRIN	ug/L	<0.02	<0.02	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
GAMMA-BHc	ug/L	<0.02	<0.02	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
METHOXYCLOR	ug/L									

Notes: N/O - None observed

* Intereference of high molecular weight hydrocarbons made laboratory unable to determine concentration of volatile organics.

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Appendix G
Characteristic Hazardous Waste Analysis Results

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CHARACTERISTICS HAZARDOUS WASTE ANALYSES

Sites 1 - 23

EP TOX	As	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
	Ba	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Cr	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Pb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Hg	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Se	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Ag	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ig.	140F	N	N	N	N	N	N	N	N	N
Cor.	pH	N	N	N	N	N	N	N	N	N
React.	CN	N	N	N	N	N	N	N	N	N
React.	S	N	N	N	N	N	N	N	N	N
	Spec	W	W	W	W	W	W	W	W	W

Ig. = Ignitability, closed cup flash point 140 degrees F
Cor.pH = Corrosivity, pH<6.0
React. = Analyses for cyanide and sulfide
Spec = Infrare Spectograph

N = None
W = Essentially Water
1 = 1% petroleum distillate/99% H20

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Appendix H
Lagoon Dissolved Oxygen
Analytical Results

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LAGOON DISSOLVED OXYGEN ANALYTICAL RESULTS (mg/l)

SITE	6 SURFACE	6A NEAR BOTTOM	14 SURFACE	14A NEAR BOTTOM	21 SURFACE	21 A NEAR BOTTOM
TIME						
0600	2	2.7	3.1	3.3	4.9	.7
0800	2	3	4.8	6.8	6.8	.7
1000	2.4	3.2	2.7	3	4.8	4.9
1400	2.1	3.2	4.8	5.2	10.2	4.8
1600	4.8	4.6	6.2	6.6	11.6	7.1
2100	.7	.7	4.9	4.8	7.1	8

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Stormwater Characterization and Lagoon Sediment Analysis Grand Forks AFB ND

JOHN G. GARLAND III, Maj, USAF, BSC

August 1990

Final Report

AF Occupational and Environmental Health Laboratory (AFSC)
Human Systems Division
Brooks Air Force Base, Texas 78235-5501

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